ARKANSAS
HEC-RAS SHORT COURSE

Course Schedule

| <u>Monday</u> | <u>Modeling River Hydraulics with HEC-RAS</u> |

7:30-8:00 a.m.   **REGISTRATION**

8:00-8:30 a.m.   **INTRODUCTION**

8:30-9:30 a.m.   1.1 Lecture: **WATER SURFACE PROFILE CALCULATIONS**

Classifications of open channel flow; velocity distribution in a channel; energy principles; cross section subdivision for conveyance calculations; friction loss equations; contraction and expansion losses; computational procedure; critical depth determination; and application of the momentum equation.

9:30-9:45 a.m.   Coffee Break

9:45-10:00 a.m.   1.2 Lecture: **RESISTANCE TO FLOW**

Discussions about Manning's equation; uniform flow equations; methods for computing **n** values: tables, pictures, and equations; examples of calibrated **n** values for various streams.

10:00-11:00 a.m. 1.3 Lecture: **GEOMETRIC DATA REQUIREMENTS FOR WATER SURFACE PROFILE CALCULATIONS**

Study limit determination; defining the river system schematic; cross section geometry and locations; optional cross section properties; ineffective flow areas, levees, and blocked obstructions; defining the reach lengths between sections; energy loss coefficients; stream junction data.

11:00-12:00 p.m. 1.4 Lecture: **STEADY FLOW DATA REQUIREMENTS**

Discussions about flow regime; boundary conditions; discharge information.

12:00-1:00 p.m. **LUNCH**

Monday   **Modeling River Hydraulics with HEC-RAS**

1:00-2:00 p.m.   1.5 Lecture   **STEPS IN DEVELOPING A HYDRAULIC**
                                      WITH HEC-RAS

                     Starting HEC-RAS; steps in developing a hydraulic model; starting a new
                     project, entering geometric date, entering steady flow data, performing
                     the hydraulic computations and viewing and printing results; getting and
                     using help.

2:00-2:30 p.m.   1.6 Workshop **INTRODUCTION TO WORKSHOP**
                                   CALCULATIONS OF WATER SURFACE PROFILES

                     Participants will learn to enter data into HEC-RAS; perform the hydraulic
                     computations; and view the results.

2:30-2:45 p.m.   **BREAK**

2:45-4:00 p.m.   1.6 Workshop (continued)

4:00-4:30 p.m.   1.7 Lecture: **OUTPUT ANALYSIS**

4:30 p.m.   Adjourn

Tuesday: **HEC-RAS Bridge Analysis**

8:00-8:30 a.m.   Review

8:30-9:45 a.m.   2.1 Lecture   **HYDRAULICS OF BRIDGE WATERWAYS**

Nature of flow through bridges; components of bridge losses; cross section locations; defining ineffective flow areas; contraction and expansion losses.

9:45-10:00 a.m.   Coffee Break

10:00-10:45 a.m.   2.2 Lecture   **SELECTING A BRIDGE MODELING APPROACH**

Available approaches to bridge loss computations within HEC-RAS; selecting the bridge modeling approach for various situations of low flow bridge hydraulics; selecting the appropriate bridge modeling approach for various situations under high flow bridge hydraulics.

10:45-11:45 a.m.   2.3 Lecture: **APPLICATION OF HEC-RAS TO BRIDGE HYDRAULICS**

Entering and editing bridge data; defining a bridge modeling approach; bridge modeling options; example bridge application; pertinent bridge output.

11:45-12:45 p.m.   **LUNCH**

12:45-2:30 P.M.   2.4 Workshop: **BRIDGE COMPUTATIONS**

Participants will learn to enter and edit bridge data; perform bridge hydraulic computations; and review pertinent results.

2:30-2:45 p.m.   Break

2:45-3:15 p.m.   2.4 Workshop continued

3:15-4:30 p.m.   2.5 Lecture: OVERVIEW **OF CULVERT HYDRAULICS**

Definition of terms; input requirements: cross section locations, ineffective flow areas, expansion and contraction coefficients; inlet control; outlet control; solution logic.

4:30 p.m.   Adjourn

Wednesday: **HEC –RAS CULVERT AND MULTIPLE OPENING ANALYSIS**

8:00-8:30 a.m.   **REVIEW**

8:30-9:30 a.m.   3.1 Lecture: **APPLICATION OF HEC-RAS TO CULVERT HYDRAULICS**

       Entering and editing culvert data; culvert modeling options; example culvert applications.

9:30-9:45 a.m.   Break

9:45-11:45 a.m.   3.2 Workshop: **CULVERT ANALYSIS**

       Participants will learn how to enter and edit culvert data, perform culvert hydraulic computations; and review pertinent output.

11:45-12:00 p.m.   **REVIEW**: Culvert Analysis Workshop

12:00-1:00 p.m.   **LUNCH**

1:00-2:00 p.m.   3.3 Lecture: **MULTIPLE BRIDGE AND CULVERT OPENINGS**

       General modeling guidelines; multiple opening approach; divided flow approach; entering multiple opening data; multiple opening output.

2:00-2:15   Break

2:15-4:30 p.m.   3.4 Workshop: **MULTIPLE OPENING ANALYSIS**

       Participants will learn how to define multiple openings; enter multiple opening data; perform the computations; and view pertinent results.

4:30 p.m.   Adjourn

Thursday:	**HEC-RAS Optional Capabilities and Floodway Determination**

8:00-8:30 .am.   Review

8:30-9:30 a.m.   4.1 Lecture: **OVERVIEW OF OPTIONAL CAPABILITIES**

Multiple plan analysis; optional friction loss equations; cross section interpolation; mixed flow regime calculations; modeling stream junctions; flow distribution calculations.

9:30-9:45 a.m.   Break

9:45-11:45 a.m.   4.2 Workshop: **MIXED FLOW REGIME CALCULATIONS**

Participants will learn how to run the model in a mixed flow regime mode, and review pertinent results.

11:45-12:00 p.m.   **REVIEW**: Mixed flow regime workshop

12:00-1:00 p.m.   **LUNCH**

1:00-1:45 P.M.   4.3 Lecture**: IMPORTING HEC-2 DATA**

Discussions will include how to import HEC-2 data into HEC-RAS; differences between the programs as it pertains to the imported data; major areas where data modifications will be necessary.

1:45-2:30 p.m.   4.4 Lecture: **FLOODPLAIN AND FLOODWAY DETERMINATION**

Floodway definitions; general guidelines; computer procedures; program input requirements for floodway calculations; available output.

2:45-3:00   BREAK

3:00-4:30 p.m.   4.5 Workshop: **FLOODWAY DETERMINATION**

Participants will learn how to enter and edit encroachment data and perform a floodway analysis.

4:30 p.m.   Adjourn

Friday: **HEC-RAS Trouble shooting and Output Analysis**

8:00-8:30 a.m.   **REVIEW**

8:30-9:30   5.1 Lecture: **TROUBLE SHOOTING WITH HEC-RAS**

                             This lecture will provide the participants with information on how to interpret HEC-RAS output messages (errors, warnings, and notes); and diagnose common data input mistakes.

9:30-9:45 a.m.   Break

9:45-11:30 a.m.   5.2 Workshop: **OUTPUT ANALYSIS**

                             This workshop will teach the participants how to analyze the HEC-RAS output in order to detect common hydraulic modeling problems.

11:30-12:00 p.m.   **CRITIQUE AND COMPLETION**

12:00 p.m.   Adjourn